DESCRIPTION OF THE COURSES

- Course code: ELR1362
- Course title: CIRCUITS THEORY IB
- Language of the lecturer: Polish

Course form	***Lecture***	***Classes***	***Laboratory***	***Project***	***Seminar***
*Number of hours/week**	*2*	*2*	*1*		
*Number of hours/semester**	*20*	*20*	*10*		
Form of the course completion	*Examination*	*Colloquium*	*Reports*		
ECTS credits	*4*	*2*	*2*		
Total Student's Workload	*120*	*60*	*60*		

- Level of the course (basic/advanced): basic
- Prerequisites: Physics, Circuits theory IA.
- Name, first name and degree of the lecturer/supervisor:
- Lobos, Tadeusz, Prof., DSc, PhD.
- Names, first names and degrees of the team's members:
    1. Gubański, Adam, PhD
    2. Janik, Przemysław, PhD,
    3. Kostyła, Paweł, PhD,
    4. Leonowicz, Zbigniew, PhD,
    5. Motyl, Edmund, DSc, PhD,
    6. Piotrowicz, Jerzy, PhD,
    7. Pospieszna, Janina, DSc, PhD,
    8. Rezmer, Jacek, PhD,
    9. Ruczewski, Piotr, PhD,
    10. Sikorski , Tomasz, PhD.
    11. Wacławek Zbigniew, PhD
- Year:.....II..... Semester:.....3.....
- Type of the course (obligatory/optional): obligatory

- Aims of the course (effects of the course): Ability to analysis of circuits in the resonance state. Skills to analysis of linear three-phase electrical circuits. Ability to determination of asymmetrical dusturbances in three-phase circuits with application of symmetrical component method.

- Form of the teaching (traditional/e-learning): traditional

- Course description:

The resonance of voltages and currents. Three-phase circuits. The power in three-phase systems. The method of symmetrical components. The analysis of disturbances. Oscillating and rotating field. Four-terminal networks.

- Lecture:

Particular lectures contents		*Number of hours*
1.	**The resonance of voltages and currents.** The resonance in the serial and parallel LCR circuit. Conditions of the resonance. The importance of resonances in electrical engineering.	**2**
2	**The resonance systems** Frequency characteristics of resonance circuits. Overvoltage. Overcurrent. Q-factor. Selectivity. Instantaneous energy. Compensation of the passive power. LCR filters.	**2**
3.	**Three-phase circuits. Basic notions.** Multiphase sources of voltage. Three- and four-leads systems. Phase and inter-phase quantities. The operator of the rotation. Vector graphs. Three-phase circuits. Flow of currents in symmetrical and asymmetrical circuits.	**2**
4	**The power in three-phase systems.** The instantaneous power in three-phase systems. The power in three-phase circuits in the triangle or in the star connections. Measurement of the active and passive power of the symmetrical and asymmetrical systems (three and four leads). Compensation of the passive power in three-phase circuits. Meters of electric energy.	**2**
5.	**The method symmetrical components.** The idea. Circuits of symmetrical components. The matrix of transformations. The measurement of impedances of symmetrical components.	**2**
6	**The analysis of symmetrical disturbances** Longitudinal and transversal disturbances. The connection of symmetrical component circuits during longitudinal and transversal disturbances	**2**
7	**Filtry** Filters of symmetrical components	**2**
8.	**The magnetic field: oscillating and rotating.** Two and three-phase rotating field. Principle of the working of asynchronous motors.	**2**

9.	**Four-terminal networks.** Definition of four-terminal network. Classification of four-terminal networks. Conditions of symmetry and invertibility. Equation of four-terminal networks (chain, admittance and impedance). Wave impedance of symmetrical four-terminal network. The coefficient of the transfer.	**2**
10.	**Four-terminal networks c. d.** Determining the constants of four - terminal network from diagram. Determination the parameters of four - terminal network on the basis of the measurements. Ways of the connection of four – terminal networks. Distribution of potentials in the insulator chain.	**2**

- Classes – the contents:

- Seminars – the contents:

Calculation of overvoltage and overcurrent during the resonance condition. Calculation of currents and voltages in three-phase circuits (symmetrical and asymmetrical). Calculation of short-circuit currents in one- and multi-phase in transmission lines. Calculation of the parameters of four - terminal networks on the basis of diagram and measurements.

- Laboratory – the contents:

Practices relating to the chosen problems of linear circuits, the investigation of the LCR circuits, three-phase circuits, star and triangle connected, the investigation of magnetically coupled circuits, the investigation of four -terminal networks.
1.Investigation of serial RLC circuits with sinusoidal excitation
2.Investigation of the parallel and serial-parallel LCR circuit with sinusoidal excitation
3.Investigation of the arrangement of magnetically coupled coils
4.Investigation of three-phase circuits
5. Investigation of four - terminal networks.

- Project – the contents:

- Basic literature:

1. S. Osowski, K. Siwek, M. Śmiałek – ***Teoria Obwodów,*** Oficyna Wydawnicza Politechniki Warszawskiej, 2006.

2. S. Bolkowski - - ***Teoria Obwodów Elektrycznych*** -WNT 1995

- Additional literature:

1. M. Uruski, W. Wolski - ***Teoria Obwodów*** *t. I, II* - skrypt P.Wr.
2. K. Mikołajuk, Z. Trzaska - ***Elektrotechnika Teoretyczna*** - PWN 1984.
3. J. Osiowski, J. Szabatin - ***Podstawy Teorii Obwodów*** t. I, II, III - WNT 1992 - 1998

- Conditions of the course acceptance/credition: Passed examination, passed colloquium, reports and self-preparation work satisfactory evaluation

* - depending on a system of studies